

SYNTAX

SERVING TIMEX-SINCLAIR
PERSONAL COMPUTERS

A PUBLICATION OF **THE HARVARD GROUP**

VOL.3 NO.11

ISSN 0273-2696

NOV., 1982

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TIMEX PRINTER AND MODEM INFO

Timex's 40-column thermal printer will be available in Dec.82 for \$99.95, says Timex VP Danny Ross. Despite its 40-column format, it LLISTs in screen format (32-col). The printer needs no interface and has its own power supply. Printer also uses the keyboard print commands. Ross also said Timex's new 300-baud modem will be ready first quarter of '83. Some features: autodial and answer and software to let ZX/TS computers communicate with other kinds of computers, making commercial data bases accessible to ZX/TS users.

TS1000 SERVICE CENTER AND COMPUTER HOTLINE

Timex's repair address: Timex Service Center, 7004 Murray St., POB K, Little Rock, AR. New hotline number for computer products: 800/248-4639. Call 8am-11pm Mon.-Fri.; 9am-9pm Sat. and Sun.

CAI OFFERS COMPUTER NETWORK PACKAGE

CAI now offers a network package including Lexicon 11 modem, ASCII modem and cable. Package (not direct-connect): \$149.95+\$2.95 P&H. Separately, network package items are: Lexicon modem \$129.95, ASCII modem \$24.95 and cable \$9.95. CAI's direct-connect phone modem is \$149.95. CAI Instruments, P.O. Box 2032, Midland, MI 48640.

MACRONICS ANNOUNCES FLOPPY DISK INTERFACE

Run a 5 1/4" disk drive with your ZX/TS and Macronic's new FIZ 1.1 interface. Interface plugs into rear edge connector with an expansion bus. FIZ interface, \$149, expansion bus \$35. Assembled and cased 5 1/4" drive with 110V 60Hz supply is \$330 extra. Prices include airmail postage. Macronics, 26 Spiers Close, Knowle, Solihull, West Midlands B93 9ES UK.

NEW PRODUCTS

ADDRESSES (with 16K available) can store 133 addresses (90 chars. each) or other data. You get 36 codes for search and listing. Entries can be made and changed and users familiar with BASIC can modify this program to suit their own needs. ACCR is a payment receipt reminder. With 16K it stores 266 entries of date, name (20 char.) and amount. It searches by code, month or name. ACCP, companion program for ACCR, works similarly and is useable for accounts payable. Tapes are \$19.95 or 3 for \$39.90. R.S. Panwar, 2035 Kentland Dr., Houston, TX 77067, 713/537-8453 (6-9 pm).

Nonvolatile Memory and I/O Ports give 6 parallel I/O ports to interface your ZX/TS to other devices. It also has sockets for up to 4 extra memories, either 2716 EPROMs, 2Kx8 static RAM or 2Kx8 nonvolatile memories or EPROM to store your own USR programs. Your Sinclair/Timex RAM plugs directly on. \$79 kit, \$99 assembled and tested. EPROM Programmer, \$79 with hardware and software to program 2716 EPROMs. Wisconsin Electronics, Box 332, Milton, WI 53563.

SALES-PLUS shows TS1000 selling points. It can be factory-customized to present retailer's name with Timex name. \$17.95 in quantity (300) including customization. Development Assoc., 1520 S. Lyon, Santa Ana, CA 92705, 714/835-9512.

Z EXTRA, a ZX/TS graphics control program (needs SLOW mode, 16K RAM min.), provides: keyboard control of graphic and display features, storage of info into high RAM for future reference, revision, or display; screen storage in "collapsed" format so you can store 60-80 screens in the top 40K of a 64K memory, menu-driven screen file handling, blinking cursors, repeat-

ing keys, 4 write directions for letters or graphics characters, 8 plot directions for pixel drawing, 4x4 and 8x8 char. sizes, plus insert, delete, search and other editing functions. Z EXTRA is user-configurable for 16-64K RAMs and can be set to use only part of your memory. Tape and instructions \$19.95 ppd. from Sinware, Box 323, Dixon, NM 87501.

Tape Loader (TL-064) and Heat Controller (OP-032), announced Oct. SYNTAX, go up Nov. 1: TL-064 will be \$22.95 and OP-032 will be \$15.95. P. Pollack, 6240 Halifax St., N.Burnby, BC Canada V5B 2P6.

Z80 System Reference Card offers formulas to calculate your own timing with any MHz; condition code chart and hex-to-decimal chart; undocumented op-codes for some chips; instructions in op-code sequence for PEEKing, and in mnemonic sequence for POKEing with decimal equivalents, \$4.95. Nanos Systems, Bx 24344, Speedway, IN 46224.

SYNTAX ERRORS: Grading Program, Oct.82, indicated line 240 as the round-up cut-off routine. Line 210 is the round-up cut-off routine.

In Unit Pricer, Oct. 82, line 84 should read as line 20. Line 4241 should read as line 145. Add line 350 STOP.

In my Monthly Calendar program, Sept.82, the characters "B" in the PRINT statements simply mean to print a blank space.

Herb Cohen, Winchester, KY

In my Hex Math improvement (Oct.82), line 530 should read:
530 LET H(X)+(INT D-INT Q*16)+28
The line is not elegant in that form. This looks better and works:
520 LET Q=INT (D/16)
530 LET H(X)=INT (D-Q*16)+28

Ronald H. Miller, Murrysville, PA

ETCHING PROGRAM--8K/1K

This program draws patterns by itself. It traces a continuous line, starting at the left-hand center edge of the screen, bouncing off the edges, and stopping only if the line leads into one corner.

ETCH fits in 1K RAM. Start the program using RUN (ENTER). When the cursor appears, enter the slope of the line; 0 yields a horizontal line; 1, a 45 diagonal up; -1, a 45 diagonal down. Values may be any number, including decimal or fractional values, but those between plus or minus 5 seem to be the most productive.

When an interesting pattern appears, type "M" to pause; hit any key to resume operation.

BREAK followed by ENTER will stop the program. To restart, just press RUN and ENTER again.

David R. Rowland, Montclair, NJ

```

110 LET X=0
120 LET Y=0
130 PLOT X, Y+20
140 INPUT Z
150 LET U = 1
160 LET T = 0
170 LET Y = Y+1
180 LET X = X+1
190 GOSUB 300
200 GOTO 170
210 LET U = 0
220 LET T = 0
230 LET Y = Y-1
240 LET X = X+1
250 GOSUB 300
260 GOTO 270
270 LET U = 0
280 LET T = 0
290 LET Y = Y+1
300 LET X = X+1
310 GOSUB 300
320 GOTO 370
330 LET U = 2
340 LET T = 1
350 LET Y = Y-1
360 LET X = X-1
370 GOSUB 300
380 GOTO 470
390 LET B=20+Z*Y
400 IF INKEY$ = "M" THEN PAUSE
41000
410 IF ABS B > 43 THEN GOTO (46
0-100*T)
420 IF ABS X = 64 THEN GOTO (46
0-100*U)
430 UNPLOT X,B
440 PLOT X,B
450 RETURN
SYNTACTIC SUM: 33948, 8K/1K

```

FIRST TALK TO MINDWARE

If you're writing software for the Timex-Sinclair personal computer, you ought to talk first to the software publishing company that will do the most for you and your program. Here's six good reasons why good programmers come to us first:

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The Timex-Sinclair computer market is no longer a mail-order, hobbyist business. We have the marketing resources to put your titles in more than 25,000 retail outlets, including chain stores, mass merchandisers, audio centers and PX's.

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FIRST, TALK TO



MINDWARE

15 Tech Circle, Natick, Mass. USA 617-655-3388

HARDWARE/SOFTWARE REVIEW

Product: QSAVE
From: Personal Software Services, 112 Oliver St.,
Coventry, U.K. CV6 5FE
Price: \$30 US (includes P&H)

QSAVE's package consists of a small plastic box with four miniature phone jacks labeled A, B, C and D, two cables with matching plugs, the tape and a manual.

After briefly scanning the manual, I plugged things together, put the tape in my recorder, typed LOAD "" and watched anxiously while nothing happened. I could not find the proper-sized screwdriver to open the shaper-amplifier so I looked more closely at the manual. The ear plug from the recorder goes to A. One short cable goes from B to the computer's ear jack. The power plug goes to C. D goes to the computer's power jack.

After I hooked up everything properly, QSAVE loaded the first time. Almost any tape will load with the shaper-amplifier.

QSAVE automatically moves the machine language (contained in two REM statements) above RAMTOP when it loads. It then prints a short menu listing USR addresses for the SAVE, VERIFY and LOAD calls.

When saving with QSAVE, you can't save programs by name and you can't save self-running programs in QSAVE code. But QSAVE's speed makes up for these shortcomings.

VERIFY is especially useful. After saving a program in QSAVE code, you can play it back to the computer with the VERIFY command (PRINT USR 32377). The program prints V=0 if everything is OK. Numbers other than zero indicate an improper volume setting or a bad recording. You can re-record before turning off the computer.

Once QSAVE is loaded (about 45 seconds), your programs in QSAVE code will load in 29 seconds. You only need to load QSAVE once per

computing session--just don't execute a NEW. When you finish with a program, enter the QSAVE Load command (PRINT USR 32371) to load another program in QSAVE code. NEW or programs that move machine language above RAMTOP will require re-loading QSAVE.

It's convenient to copy QSAVE at the front of tapes containing programs in QSAVE code. To put QSAVE onto another tape, don't type SAVE. To preserve QSAVE's load and execute features, start the recorder then type RUN ENTER. QSAVE will save itself.

I am very pleased with QSAVE's package. The hardware definitely aids in loading balky tapes and the time saved in loading long programs is certainly worthwhile.

C. Nunnery, Fort Walton Beach, FL

SELF RUNNING PROGRAMS--8K

Making a self-running program on the ZX81 is very simple. Just insert a SAVE statement at the place you want the computer to continue from. The SAVE statement acts like a CONTINUE statement, continuing at the next line with the same variables it left off with. So a self-running program eliminates the need for the user to start the program. It also lets you put executable statements after the SAVE command.

After entering the example, type NEW, LOAD "ZZ" and the screen should display the character set from your keyboard then pause about 2 seconds. This program shows that the ZX/TS saves the screen content, variables and the line the program was saved on.

Chris White, Lake Forest, IL

```
10 FOR A=1 TO 255
20 PRINT CHR$(A);
30 NEXT A
40 PAUSE 100
50 SAVE "ZZ"
60 PAUSE 100
SYNTACTIC SUM: 4942,8K
```


BOOK REVIEW

Title: ZX81 BASIC Book
By: Robin Norman
From: ITT Publishing
Howard W. Sams
4300 W.62nd St.
Indianapolis, IN 46026
317/298-5400
Price: \$12.95 (softcover, 192 pp.)

Your ZX81 BASIC Programming book supplied with your ZX81 computer documents the hardware and software aspects of the computer, but does not give a thorough enough introduction to BASIC if your ZX/TS is your first computing experience.

Norman begins at the level of the rankest beginner and helps him or her "learn to use all the instructions in ZX81 BASIC using a structured course with a steadily increasing tempo."

Short of teaching someone else, the best way to learn is by doing. This book is excellent proof of that dictum. Chapter by chapter, the learner is given examples to enter and run, and programs to write (with working sample solutions in an appendix). Chapter summaries itemize specifically what is new in the chapter. I find the style acceptable, the content interesting and informative, and the programs challenging. Beginners should find much of value in this book.

Appendices include a complete list of all ZX81 BASIC instructions with definitions, a glossary, 14 varied ZX81 programs, sample answers to program exercises, and directions for expanding to 16K RAM. A thorough index is included.

Norman's book suffers minor problems. There should have been more careful proofreading; mistakes in the text are not too troublesome but typos in programs cause problems. Except for "Black Box," these fall into two classes: lack of clarity and consistency about the use of spaces in PRINT strings,

and occasional incorrect use of commas and semicolons.

I ran a good selection, but not all, of the programs listed in Appendix 3. They include 1K RAM programs ranging from "Random Rectangles" and other graphic displays, and several mathematical programs like "Moving Averages" and "Finding Factors" to interactive graphics like "Drawing Pictures" and "Cows and Bulls" and games like "Electronic Dice" and "Reaction Time." There are 16K RAM versions of "Drawing Pictures," "Telephone List," and "Black Box." In "Black Box" the computer hides 4 atoms in a 64-box matrix. However, the program needs the following corrections to run satisfactorily:

```
285, 290, 295, 4230 read I$ for 1$
250 PRINT AT 0,22;"WHAT NOW?";
TAB 24;"=END"
1190 GOTO 2600
1540 LET Y=Y-1
2440 LET X=X-1
```

Line 250 lets the display work. Improve it by adding:

```
7 FAST
190 PAUSE 50
505 GOSUB 3300
3650 PRINT AT 5,26;X
3690 PRINT AT 8,27;4
3765 GOSUB 3300
```

Toward the end of the preface, Norman comments to all computer users, "You cannot 'read' a book like this. Whatever you get out of it will be the result of a three-way interaction between you, this book, and the ZX81. And if you ever find yourself thinking, 'What would happen if...?' then for goodness sake, try it! You won't break the ZX81 and you'll probably learn something."

I found this book informative and easy to follow. I am happy to recommend it to beginners.

Ronald H. Miller, Murrysville, PA

STAR HUNTER--8K/1K

In Star Hunter, you control a laser cannon that fires when you press "F". The cannon aims upward when you hit "D" and downward when you hit "C". You may fire and move simultaneously.

Your ship is stationary on the left side of the screen as stars move towards you. The object is to shoot a star before one of them hits the left side of the screen. For every star you destroy, you are awarded 150 points. When you top 1500, a faster attack wave starts and your score resets to 0.

To exit, hit break and ENTER.

Robert L. Nappi, Ashtabula, OH

```

1  RAND
2  LET R=0
3  LET P=0
4  LET A=R+1
5  LET A$=""
10 LET A=11
20 LET B=0
30 LET O=INT (RND*20)+1
31 LET W=O+5
34 IF O-A>W-B THEN GOTO 30
40 CLS
41 PRINT AT 0,25;P
42 PRINT AT 0,10;"ATTACK WAVE"
";R
50 PRINT AT A,B;">"
60 PRINT AT A+1,B;" "
70 PRINT AT A-1,B;" "
80 IF INKEY$="D" THEN LET A=A-1
1  90 IF INKEY$="C" THEN LET A=A+1
1  100 PRINT AT 0,W;"* "
110 LET W=W-R
111 IF W<2 AND ABS (A-O)<2 THEN
STOP
113 IF W<2 THEN GOTO 10
120 IF INKEY$="F" THEN GOTO 150
140 GOTO 50
150 PRINT AT A,B+3;A$
151 PAUSE 5
152 CLS
153 IF A=0 THEN GOTO 200
190 GOTO 50
200 PRINT AT 0,W;"SMASH"
210 LET P=P+150
220 PAUSE 20
221 IF P>1500 THEN GOTO 3
240 GOTO 10
SYNTACTIC SUM: 40582, 8K ROM

```

If you have more than 1K RAM, try adding Dan Tandberg's Blast Effects (Aug.82) or Paul Quall's Screen Background (Jun.82) routines.--Ed.

PIE CHART GRAPH AND DISPLAY--8K/16K

This program draws a pie chart graph with up to 10 sections on 8K ROM, 16K RAM machines.

Enter Pie, then RUN. The computer asks for the number of categories (segments) you want and then each category's name and value. Answer each question as it appears, pressing ENTER after each. The title is limited to 10 characters.

After your last entry, your ZX/TS draws the graph. It also lists the categories with their percentages of the total.

To copy the graph and listing on a printer, enter Y in response to the question printed at line 4. Line 947 determines whether to copy the screen; if your printer does not use the ZX/TS keyboard printer commands, modify line 947 to use your printer's command to copy the screen display.

Segment resolution is fairly good, down to 17% of the total.

To chart new data, RUN Pie again. It stops after each run.

Ron Oblander, Ann Arbor, MI

```

1  REM PIE
2  PRINT AT 20,0;"PROGRAM TO D
RAW A PIE CHART FOR UP TO TEN CA
TEGORIES"
3  SCROLL
4  PRINT "IS PRINTED OUTPUT DE
SIRED?"
5  SCROLL
6  PRINT "ENTER Y/N--";
7  INPUT A$
8  PRINT A$
16 SCROLL
20 PRINT "ENTER NUMBER OF CATE
GORIES--";
21 INPUT C
22 PRINT C
23 DIM E(C)
24 DIM C$(C,10)
25 FOR D=1 TO C
26 SCROLL
27 PRINT "ENTER TITLE OF CATEG
ORY ";D
28 INPUT C$(D)
29 SCROLL
30 PRINT C$(D)
36 SCROLL
41 PRINT "ENTER VALUE FOR CATE
GORY ";D;"--";
42 INPUT E(D)
43 SCROLL
44 PRINT E(D)
49 NEXT D
50 LET T=0
55 FOR F=1 TO C

```



```

57 LET T=T+E(F)
59 NEXT F
60 SCROLL
61 PRINT "TOTAL AMOUNT IS ";T
62 SCROLL
63 SCROLL
64 PRINT "PRESS ENTER TO CONTI
NUE"
65 INPUT B$
70 FOR G=1 TO 22
75 SCROLL
80 NEXT G
85 CLS
100 REM CIRCLE
105 PLOT 31,21
110 LET RAD5=21
120 FOR P=0 TO 90 STEP 2
130 LET RADN=.017453*P
140 LET A=SIN RADN*RAD5
150 LET B=COS RADN*RAD5
160 PLOT (31+B),(21+A)
170 PLOT (31-B),(21+A)
180 PLOT (31-B),(21-A)
190 PLOT (31+B),(21-A)
200 NEXT P
210 DIM S(C)
215 DIM Z(C)
220 FOR X=1 TO C
230 LET S(X)=E(X)/T
235 NEXT X
240 FOR L=0 TO RAD5
250 PLOT 31,(21+L)
260 NEXT L
270 FOR Y=1 TO C
280 LET Z(Y)=S(Y)*360*.017453
290 NEXT Y
400 DIM U(C)
403 LET U(1)=Z(1)
405 FOR Y=2 TO C
410 LET U(Y)=Z(Y)+U(Y-1)
420 NEXT Y
440 GOTO 600
450 FOR Y=1 TO C-1
460 IF U(Y)>=0 AND U(Y)<=.5*PI
THEN GOTO 650
470 IF U(Y)>.5*PI AND U(Y)<=PI
THEN GOTO 600
480 IF U(Y)>PI AND U(Y)<=1.5*PI
THEN GOTO 550
500 LET U(Y)=2*PI-U(Y)
510 FOR L=0 TO RAD5
520 PLOT 31-SIN U(Y)*L,21+COS U
(Y)*L
530 NEXT L
540 GOTO 680
550 LET U(Y)=U(Y)-PI
560 FOR L=0 TO RAD5
570 PLOT 31-SIN U(Y)*L,21-COS U
(Y)*L
580 NEXT L
590 GOTO 680
600 LET U(Y)=PI-U(Y)
610 FOR L=0 TO RAD5
620 PLOT 31+SIN U(Y)*L,21-COS U
(Y)*L
630 NEXT L
640 GOTO 680
650 FOR L=0 TO RAD5
660 PLOT 31+SIN U(Y)*L,21+COS U
(Y)*L
670 NEXT L
680 NEXT Y
685 FOR Y=1 TO C
690 IF U(Y)>=0 AND U(Y)<=.5*PI
THEN GOTO 750
695 IF U(Y)>.5*PI AND U(Y)<=PI
THEN GOTO 735
700 IF U(Y)>PI AND U(Y)<=1.5*PI
THEN GOTO 720
705 LET U(Y)=2*PI-U(Y)

```

```

710 PRINT AT 11-COS U(Y)*10,15-
SIN U(Y)*10;Y
715 GOTO 752
720 LET U(Y)=U(Y)-PI
725 PRINT AT 11+COS U(Y)*10,15-
SIN U(Y)*10;Y
730 GOTO 752
735 LET U(Y)=PI-U(Y)
740 PRINT AT 11+COS U(Y)*10,15+
SIN U(Y)*10;Y
745 GOTO 752
750 PRINT AT 11-COS U(Y)*10,15+
SIN U(Y)*10;Y
752 NEXT Y
753 PRINT AT 11,15;"*"
755 GOTO 900
800 REM MARKING OF SEGMENTS
810 DIM U(C)
820 LET U(1)=Z(1)/2
830 FOR Y=2 TO C
840 LET U(Y)=Z(Y)/2+U(Y-1)
850 NEXT Y
860 GOTO 450
900 IF A$="Y" THEN COPY
904 PAUSE 200
905 CLS
910 PRINT "CATEGORY";TAB 14;"AM
OUNT";TAB 23;"PERCENT"
915 PRINT
920 FOR Y=1 TO C
925 PRINT Y;" ";C$(Y);TAB 15;E
(Y);TAB 22;S(Y)*100
935 NEXT Y
940 PRINT TAB 14;"-----"
945 PRINT TAB 9;"TOTAL";TAB 15;
T
947 IF A$="Y" THEN COPY
950 STOP
SYNTACTIC SUM: 23272, 8K/16K

```

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SOLAR PROGRAM FOR FLAT PLATE COLLECTORS--3K and up

If you're using solar technology to reduce your energy bills, a computer can help maximize your benefits. SOL will help you orient that flat plate collector.

You need the following information: your latitude, vertical tilt of the collector, and azimuth (deviation from true south)--all in decimal degrees. You can adjust the tilt to receive minimum heat in summer or equalize the tilt (vertical); add 20 percent for months of snow cover. Because of screen limitations, hourly totals are not printed out. They are available while the program is running--I(B). Changes made to run in the ZX81 cause slight inaccuracy, but the results are within 2% of those obtained with a larger computer.

SOL runs with 3K RAM and up. If you omit the graph routine (lines 640-890), it should run in 2K. The program takes about 3.5 minutes to run--it goes through the subroutine 132 times. The graph gives an easy-to-interpret picture of year-around performance. Remember that the monthly figures are for one day only and that they assume no shade.

Ed Battenhoff, Grand Rapids, MI

Based on "Adapting the Sun's Energy" by Jerry Berry appearing in the June, 1982, issue of BYTE magazine. Copyright © 1982 BYTE Publications, Inc. Used with permission of BYTE Publications Inc.

```
10 REM "SOL"
20 GOTO 8220
30 REM SUBR TO CALC BTUS
40 FAST
50 LET I=429*(J+(.034*COS (360
*N/365*F)))
60 LET D=23.45*SIN (360*(284+N
)/365*F)
70 LET O=D*F
80 LET S=(SIN L*SIN D+(COS L*C
OS D*COS H1))
90 LET M=50R (1229+(614*ABS S)
**2)-(614*S)
100 IF M>94.976 THEN LET X=0
```

```
110 IF M<=94.976 THEN GOTO 8130
120 GOTO 8140
130 LET X=EXP (-.65*M)
140 LET Y=EXP (-.095*M)
150 LET I=I*.56*(X+Y)
160 LET C=SIN D*(SIN L+COS T-(C
OS L*SIN T*COS A))
170 LET C=C+COS D*COS H1*(COS L
*COS T+(SIN L*SIN T*COS A))
180 LET C=C+COS D*SIN T*SIN A*5
IN H1
190 LET I=I*C
200 IF I<0 THEN LET I=0
210 RETURN
220 DIM I(12)
230 DIM G(12)
240 LET J=1
250 LET K=20
260 LET F=PI/180
270 SLOW
280 PRINT "SOLAR ENERGY,BTU/30F
T/DAY"
290 PRINT ",,"FOR FLAT PLAT COLL
ECTOR"
300 PRINT ",,"USE DECIMAL DEGREE
S"
310 PRINT "LATITUDE?"
320 INPUT LL
330 PRINT "TILT ANGLE?"
340 INPUT TT
350 PRINT "AZIMUTH?"
360 INPUT AA
370 LET L=LL*F
380 LET T=TT*F
390 LET A=AA*F
400 LET U=0
410 LET N=21
420 FOR O=J TO 12
430 LET H=75
440 LET P=0
450 FOR B=J TO 11
460 LET H1=H*F
470 GOSUB 8040
480 LET I(B)=I
490 LET H=H-15
500 LET P=P+I(B)
510 NEXT B
520 LET N=N+30.36
530 LET G(O)=INT (P+.5)
540 LET U=U+P
550 NEXT O
560 CLS
570 PRINT TAB 10;"SOLAR TABLE";
",,"LAT=";LL;" TILT=";TT;"
",,"AZ=";AA
580 PRINT "MONTH MONTH B
TU/DAY/30FT"
590 PRINT
600 FOR I=J TO 12
610 PRINT TAB 5-LEN STR$ I;I;TA
B 25-LEN STR$ G(I);G(I)
620 NEXT I
630 PRINT ",," TOTAL(1 DAY/MO)
=";TAB K;INT (U+.5)
640 PRINT ",," (FOR GRAPH,USE
"CONT")
650 POKE 16418,J
660 STOP
670 SLOW
680 LET A$=" +-----+
690 FOR I=J TO K+J+J
700 PRINT A$
710 NEXT I
720 PRINT AT K,J;" 5";AT 15,J;"
10";AT 10,J;"15";AT 5,J;"20";AT
0,J;"25"
730 PRINT AT K,15;"5";AT 15,15;
"10";AT 10,15;"15";AT 5,15;"20";
AT 0,15;"25"
```



```

740 FOR A=J TO 12
750 IF G(A) < 376 THEN GOTO 8770
760 PLOT A*2+5, ((G(A))/50)-8
770 NEXT A
780 POKE 16418,J
790 PRINT AT J+J+K,0;" JFMANKU
JASOND (MONTH"
800 PRINT AT 0,K;"SOLAR RAD"
810 PRINT AT J+J,K;"BTU/DAY";AT
0,7;"X100"
820 PRINT AT 4,K;"PER 50 FT"
830 PRINT AT 6,K;"LAT = " ;LL
840 PRINT AT 8,K;"TILT= " ;TT
850 PRINT AT 10,K;"AZIM= " ;AA
860 PRINT AT 14,K;"(FOR TABLE,"
;AT 16,K;"USE ""CONT"")"
870 STOP
880 FAST
890 GOTO 8560
SYNTATIC SUM: 54737, 8K ROM

```

DECIMAL-HEXADECIMAL CONVERSION PROGRAM--8K/16K

This utility program converts values in decimal (base 10) from 0-65535 to hexadecimal (base 16) equivalents. It also takes hexadecimal values from 0-FFFF and converts them to decimal equivalents. After entering the listing, simply RUN--prompts and error messages will help you along. The program can also be listed on a printer. Decimal-Hex Conversion was developed by Softcrest, New Canaan, CT.

Gytis Adams Kevis, New Canaan, CT

```

1 REM ...A..PRODUCT..FROM...
2 REM ...SOFTCREST...
3 REM ...P.O. BOX 854...
4 REM ...NEW CANAAN...
5 REM ...CONNECTICUT...06840...
6 REM ...COPYRIGHT...1982...
7 REM ...BY...GYTIS...ADAMS...
8 REM .....
10 DIM H$(16)
20 DIM R$(4)
30 DIM D$(16)
40 DIM B(4)
50 DIM T(4)
52 LET T(1)=4096
54 LET T(2)=256
56 LET T(3)=16
58 LET T(4)=1
60 LET HC=16
70 LET G=1000
80 REM .....
100 LET A=28
110 FOR C=1 TO 16
120 LET H$(C)=CHR$(A)
130 LET A=A+1
140 NEXT C
150 CLS
160 PRINT AT 9,0;"ENTER CONVERS
ION CODE:"

```

```

170 PRINT AT 11,4;"1 --> FOR DE
CIMAL TO HEX "
175 PRINT AT 13,14;"OR"
180 PRINT AT 15,0;" 2 --> FO
R HEX TO DECIMAL "
190 INPUT P
200 IF P=1 OR P=2 THEN GOTO 260
210 CLS
220 PRINT AT 10,2;"RE-ENTER CON
VERSION CODE"
230 PAUSE 100
240 CLS
250 GOTO 150
260 CLS
270 GOSUB G*P
280 PRINT AT 10,2;"MORE CONVERS
IONS Y/N ?
290 INPUT P$
300 IF P$ <> "N" THEN GOTO 50
310 CLS
320 STOP
330 REM .....
1000 CLS
1010 PRINT AT 10,2;"ENTER DECIMA
L VALUE 0-65535"
1020 INPUT P
1030 LET Z=P
1032 IF P <> 0 THEN GOTO 1040
1034 LET R$=" 0"
1036 GOTO 1175
1040 IF P > 0 AND P < 65536 THEN GOT
O 1100
1050 CLS
1060 PRINT AT 10,2;"DECIMAL VALU
E INVALID"
1070 PRINT AT 11,2;" RE-ENTER A
RGUMENT"
1080 PAUSE 100
1090 GOTO 1000
1100 FOR C=4 TO 1 STEP -1
1110 LET X=INT (P/HC)
1120 LET Y=X*HC
1130 LET R=(P-Y)+1
1140 LET R$(C)=H$(R)
1150 LET P=Y
1160 NEXT C
1170 GOSUB 1220
1175 PRINT AT 1,0;"*****
*****"
1180 PRINT AT 2,0;"*";TAB 2;" DE
CIMAL HEXIDECIMAL * "
1190 PRINT AT 3,0;"*";TAB 27;"*"
1200 PRINT AT 4,0;"*";TAB 5;Z;TA
B 12;"*";TAB 18;R$;TAB 27;"*"
1205 PRINT AT 5,0;"*****"
1210 RETURN
1220 FOR C=1 TO 4
1230 IF R$(C) <> "0" THEN GOTO 126
0
1240 LET R$(C)=" "
1250 NEXT C
1260 RETURN
1270 REM .....
2200 CLS
2010 FOR C=1 TO 4
2020 LET B(C)=0
2030 NEXT C
2040 PRINT AT 10,2;"ENTER HEXIDE
CIMAL VALUE 0-FFFF"
2050 INPUT D$
2052 LET D$(5 TO 6)=" "
2054 GOSUB 2300
2060 GOSUB 2200
2070 FOR C=1 TO 4
2080 IF D$(C)="" THEN GOTO 2110
2090 LET P=CODE D$(C)-28
2100 LET B(C)=P*T(C)

```

```

2110 NEXT C
2120 LET A=0
2130 FOR C=1 TO 4
2140 LET A=A+B(C)
2150 NEXT C
2155 PRINT AT 1,0;"*****"
*****
2160 PRINT AT 2,0;"#";TAB 2;"..HE
XIDECIMAL    DECIMAL  #
2170 PRINT AT 3,0;"#";TAB 27;"#"
2180 PRINT AT 4,0;"#";TAB 5,0$;T
AB 15;"#";TAB 19;A;TAB 27;"#"
2185 PRINT AT 5,0;"*****"
*****
2190 RETURN
2200 LET S=1
2210 FOR C=6 TO 2 STEP -1
2220 IF D$(4)<>" " THEN GOTO 229
2230 LET D$(C+1) TO 6)=D$(C TO
C-1)
2240 LET D$(5)=" "
2250 LET S=S+1
2260 NEXT C
2290 RETURN
2300 LET E=0
2310 FOR C=1 TO 4
2315 IF D$(C)=" " THEN GOTO 2330
2320 IF CODE D$(C)>255 OR CODE D$(
C)<45 THEN LET E=1
2330 NEXT C
2340 IF E=0 THEN GOTO 2399
2350 GOSUB 2400
2360 GOTO 2300
2399 RETURN
2400 CLS
2410 PRINT AT 10,2;"    INVALID
CHARACTER (S)"
2420 PRINT AT 11,2;"CHECK AND RE
-ENTER YOUR VALUE"
2430 INPUT D$
2435 CLS
2440 LET D$(5 TO 6)=" "
2450 RETURN
SYNTACTIC SUM: 34864, 8K/16K

```

MC PROGRAMMING #11: STORING MC SUBROUTINES IN REM

[All numbers in this article refer to the 4K ROM ZX80; for 8K ROM (ZX81/TS1000), see "Machine Code Programs: Where and How to Load Them" in Syntax Quarterly, Winter 1982.--EO]

While you can store machine code subroutines anywhere in your BASIC program, the best place is 1 REM (& 2 REM, if you have two subroutines).

The first address will always be 16427. The first BASIC program address is 16424 and holds 0 if the program line number is less than 256. The second address, 16425, will hold 1 for line 1. 16426 holds the code for REM, 254, and the

first subroutine address will thus be 16427.

Since subroutines use non-character code numbers, displaying MC bytes usually makes the ZX80 crash. 1 REM is the easiest line to keep off-screen since it is at the "top" of your program.

If you store your subroutine below other program lines, adding or editing program lines above it will change subroutine addresses.

Here is an easy method for entering MC subroutines:

1. Reserve some storage space for storing your machine code program. Enter "1 REM AAA" etc., including as many A's as bytes your subroutine requires. Any character will do; the idea is just to reserve addresses.
2. A buffer against listing line 1 is advisable, so enter 2 REM B. (This will not protect against line 1 showing after hitting HOME or LIST, however.)
3. Now, or after entering the input loop, POKE 16403,2 to bump line 1 off-screen. This trick will also work if you accidentally LIST and the screen is "skewed" but not "scrambled". Move the cursor down a few lines first, though.
4. Enter the input loop:

```

100 FOR X=16457 TO 16457+(xx-1)
110 INPUT Y
120 POKE X,Y
130 PRINT PEEK X,
140 NEXT X

```

Where xx is the number of bytes in your machine code.

5. GO TO 100 and enter your codes. Entering from a 4-column written table eases input checking.
6. SAVE on tape in case your subroutine crashes.
7. Enter LET Q=USR(16427) to test your subroutine for a crash. ("Q" can be any variable letter.)
8. Enter the rest of your BASIC program.

Next month: CALLING AND RETURNING
Jon Bobst, Zeta Software, PO Box
3522, Greenville, SC 2608-3522

SOFTWARE REVIEW

Product: ZX81 Home Computer
Package: Etch-A-Screen,
Music Composer, Checkbook
Balancer, Billboard
ROM/RAM required?: 8K/16K
Printed Listings?: No
Programs Listable?: No
Easy to Load?: Yes
Written in: Machine Code
Display: Good
From: Lamo-Lem Laboratories, Box
2382, La Jolla CA 92038
Price: \$9.95

Lamo-Lem's Home Computer Package of 4 machine code programs offer a good variety for a reasonable \$9.95.

Billboard gives you a continuous left to right scrolling screen-size message. The message can be up to 250 characters and repeats until you enter a new one. You can even save your message on tape. The graphic display is clear and steady and it's the kind of item that could be a visual enhancement at a convention or store window or for simple fun.

Etch-A-Screen lets you draw a picture anywhere in the top 17 screen rows. The pen moves in all directions including diagonally and holding down one of the designated graphic keys gives you continuous line movement. The directions to this program were hazy in sections. For example, it is unclear in the manual that to get the asterisk (the drawing pen) to appear, you must hold down one of the arrow keys while shifting. Also, the directions neglect to explain that you must press shift A to clear the title screen and then shift 9 (graphics mode) to actually draw. These problems are minor when stacked against the program's merits. Lamo-Lem includes a screen display sheet if you want to plot out your masterpiece before you start.

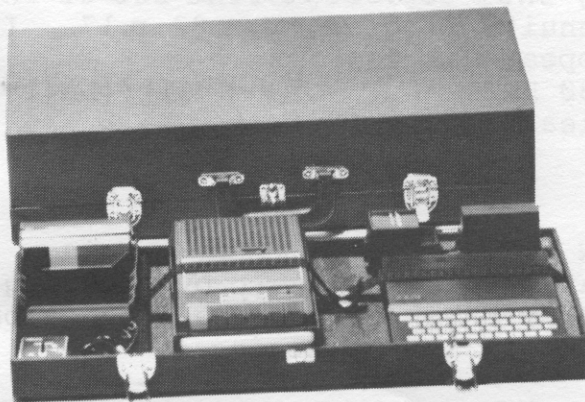
Music Composer lets you play 4 octaves on your computer. The

sound reproduces poorly through the TV, but is better through a radio. The directions are clear and straightforward and Lamo-Lem provides you with a color keyboard overlay that translates ZX81 keys into octave keys, special effects keys and edit keys. A music composition sheet is included for serious composers.

Checkbook Balancer tabulates your checking account and coordinates it with your monthly bank statement. It also comes with a keyboard overlay that assigns (+), (-), CLEAR, VOID, ENTER and SAVE functions to keys on your ZX/TS.

Each program comes with notes for advanced programmers, making possible such extras as reprogramming Composer to play Sinclair's BASIC as if it were music. Reference cards, which summarize program commands, are included for 3 programs. The ZX81 Home Computer Package is a worthy set of programs for a good price.--PPW

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DEAR EDITOR

I have a couple of questions concerning Sinclair's Spectrum.

First, will SYNTAX cover the Spectrum and its associated hardware? If so, when will there be an in-depth review? How about a comparison between the Spectrum and the VIC-20 or other comparable computers?

Also, what is the Spectrum's availability and price?

Russell L. Gagnon, Oscoda, MI

For more info see SYNTAX May 82 p.4, and Sept.82 p.7. We will compare Spectrum to other low-cost color machines such as the VIC-20 and the TRS-Color in future issues of SYNTAX and SQ. We will expand our coverage on Spectrum when it becomes available; expect US introduction early 1983. UK pricing for the 16K version is 125, and goes to 175 for 48K. UK Spectrums work only with UK TVs.--KO

I am having difficulty getting my ZX81 to accept line 280 of an Annuity Program, Jun.82 p.17. It appears as follows:
280 LET N=(LN (R/(R-S*I)))/(LN(1+I))
Please advise!

R.J. VanEstenberg, El Cajon, CA

LN is a function token meaning natural log; type it by pressing SHIFT ENTER to get the F function cursor, then pressing Z.--EO

I have a MicroAce with 4K ROM and 2K RAM. It runs well with the 4K ROM but when I put Sinclair's new 8K ROM in place it didn't work. The TV image was very distorted. I tried switching it on and off, pressing all the command keys, even changing ROMs, but the computer still remained distorted. Any suggestions?

Nivio Swami A. Valois, Brazil

We can't tell from your letter if you made the changes described in SYNTAX Apr.81. You can't just unplug MicroAce's ROM and insert a Sinclair ROM--the pinouts differ slightly. Once modified for Sinclair's 8K ROM, the socket only works directly with Sinclair's 4K ROM.--KO

Do you know any way that sound can be used with a Sinclair ZX81, via a recorder or any other method?

Carl Bush, Baltimore, MD

Generate tones in machine code by toggling bit 0 of A between executions of OUT FF instructions. Change frequency using time-eating loops. Listen with a speaker attached to the ear jack of your recorder, set up for SAVE. This method works only in FAST, perhaps why game manufacturers don't use it. Quicksilver offers a sound board accessory for £26.00 or about \$45. You'll also need OS's motherboard, £12 or about \$20.--EO

I recently came across a good deal on a batch of 4116 integrated circuits, which are 16Kx1 dynamic memory chips. Can I build additional random access memory for my ZX81 with these?

Patrick d'Entermont, NS, Canada

You can try to duplicate the 16K RAM pack, but only do it to gain the experience of building it--it's not a worthwhile project to save money. You'll spend many hours trying to duplicate their circuit. See Sinclair's 16K RAM schematic in SQ, Winter 82.--KO

In machine code programs the "RST 28" instruction, (hex EF) which causes a jump to the floating arithmetic, is very valuable.

I am aware of how certain data codes following this instruction can be used to perform functions on

the stack. However while happily searching through the ROM (8K) for "RST 28" instructions, I came upon some data codes I was not aware of. For example, the code (hex) A0 was commonly used. SYNTAX readers would benefit from a list of these codes and their functions; a lot of aspiring machine code programmers don't even know about the wonderful "RST 28" instruction.

Referring to the above, I made sure that the (hex) EF's were not part of another instruction by checking for the exit code (34).

Joseph G. Kuzma, Jackson, MI

In 8K ROMs, floating point instructions follow RST 28. The ROM routine at 0028H interprets these, and they are explained in Ian Logan's ROM Disassembly Part B, available from Gladstone Electronics, 1585 Kenmore Ave., Buffalo, NY.--EO

Ross Shuping of Greenville, NC asked about a way to merge two or more programs (Sept.82 p.12).

I first POKE one program above RAMTOP, thereby protecting it from being erased while you load the other program in. Then, POKE the protected program back into the display file immediately above the program that you just loaded. You can extend this procedure indefinitely, RAM space permitting. Send me \$2.00 and a SASE I will send a detailed explanation of this procedure to anyone who needs it.

Harold Miller, Rt. 2 Box 2330,
Clayton, GA 30525

It was interesting to note in SYNTAX the complete opposite of the problem I am encountering--horizontal bars on the screen.

I, too, have the 9.75 VDC 650 ma power pack. Even with 1K memory, I still get the bar travelling up the screen; but, in my case, it gradually disappears the longer the unit is operating.

I opened the case and found four diodes with no designation on them. As Mr. Bosley intimated in SYNTAX Aug.82, p.12, it could be one or two of the diodes.

Is there any way I can find out what the replacement value is for these diodes?

William Mitchell, Ontario, Canada

Use 1N4002s--KO

USERS' GROUPS

Here's our latest list of new ZX/TS users' groups. To check for a local group not listed, drop us a line (with a self-addressed stamped envelope) or call. We'll refer you to any group we know of. To list your group, write or call and we'll send interested people to you. SYNTAX, RD 2 Box 457, Harvard MA, 01415, 617/456-3661.

Franklin County, VA: Gary Preston, c/o Irvin, Route 1, Box 21, Glade Hill, VA 24092.

Mechanicsburg, PA: Central PA ZX81 and TS1000 Users Group, G Antrim Dr., Mechanicsburg, PA 17055, 717/766-8365.

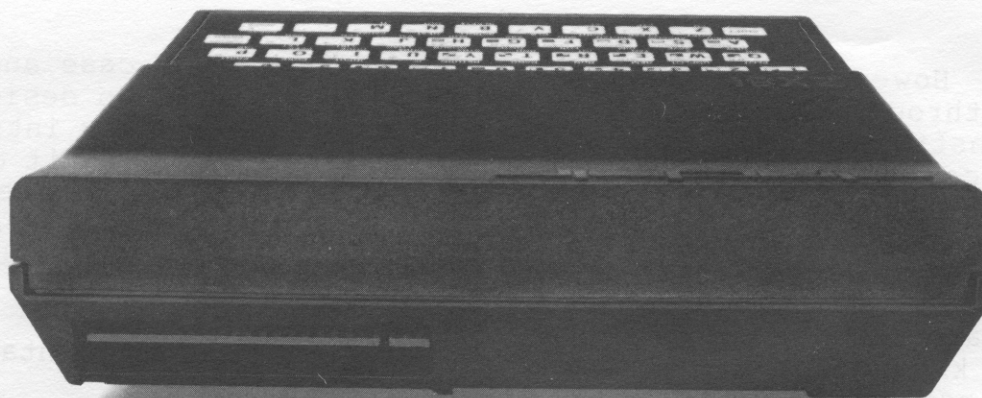
Montclair, NJ: North Jersey Timex-Sinclair Users Group, 133 Christopher St., Montclair, NJ 07042.

Monterey, CA: John Caylor, 698 Van Buren, Monterey, CA 93940, 408/372-7988.

Nashua, NH: Nashua Area Radio Club, 11 Briand Dr., Nashua, NH 03063. Send SASE for details.

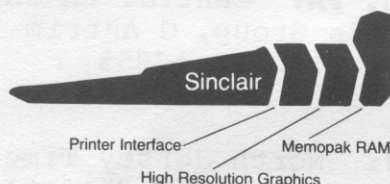
Petaluma, CA: Personal Computer Services, Northern Calif. Sinclair Users Group, 129 Saratoga Ct., Petaluma, CA 94952.

Rockford, IL: Robert Cunningham, 1602 Midway Dr., Rockford IL 61103, 815/877-8106.



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Memopak High Resolution Graphics The Memopak HRG contains a 2K EPROM monitor and is fully programmable for high resolution graphics. The HRG provides for up to 192 by 248 pixel resolution.

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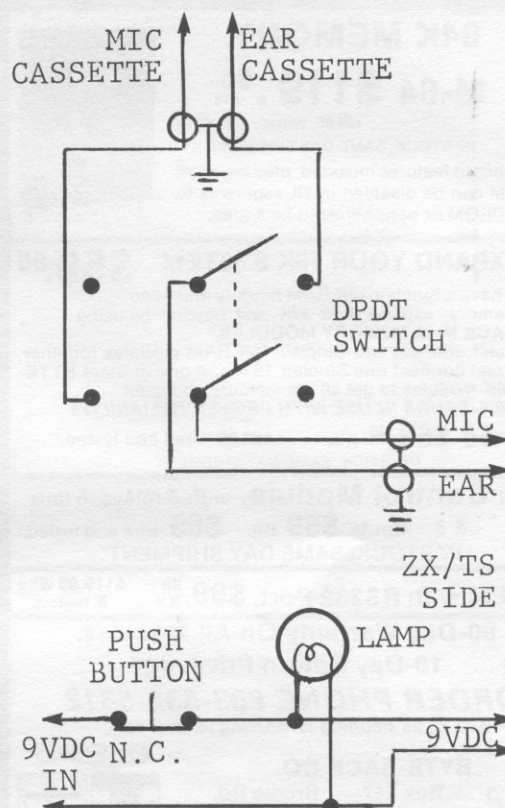
HARDWARE PROJECT

This circuit will simplify loading and saving programs by eliminating ground loop noise without the need to pull out the earphone plug during saving and the microphone plug during loading. A separate switch resets.

Build this circuit with jacks on the input (power and cassette) side and plugs on the computer side. Use a small DPDT switch for the cassette switch and a normally closed pushbutton switch on the "hot" (tip) side of the power supply circuit. Use a 12V pilot lamp (Radio Shack 272-332) and coaxial cables. Be careful to keep connections tip to tip and ring to ring; mistakes here can be serious.

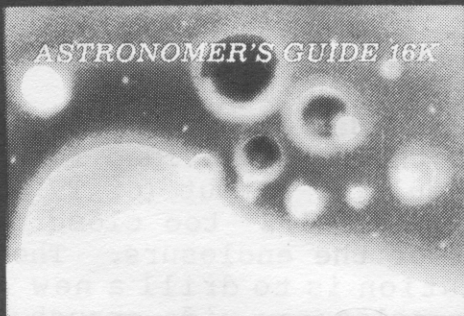
To save a program, throw your switch so that MIC connects; to load, use the other position. Reset with the pushbutton.

Martin Albrecht, Oakland, CA

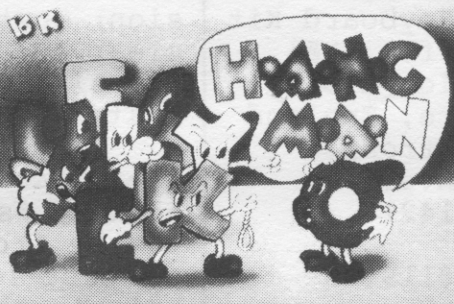


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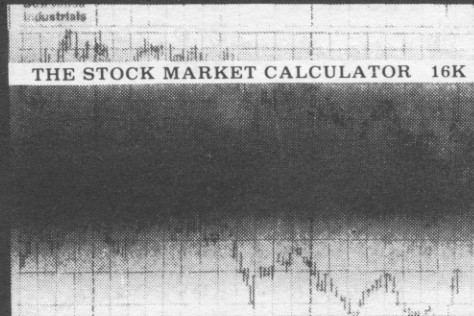


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CHECKS



HARDWARE REVIEW

Product: Computer Keyboards
Professional Keyboard Kit
and Enclosure for ZX81

From: Dean Electronics LTD.
Ascot Birkshire, England
Gladstone Electronics
1585 Kenmore Ave.
Buffalo, NY 14217
716/874-5510

Price: Keyboard Kit \$119.95
Enclosure \$29.95

To get full use of this keyboard, I strongly suggest the extra investment for the enclosure. It allows the ZX/TS printed circuit board (PCB) to be housed in the same unit with the keyboard.

Keys are marked with Sinclair legends, and the keytops are removable. There are also six extra keys for any future use. The kit comes with complete instructions for removing the ZX/TS PCB and remounting it in the enclosure. It

also details connecting the PCB to the keyboard. Two ribbon cables are provided for this purpose. The completed unit is an attractive black aluminum case with a sloped front and clear, easy-to-read keys. There's plenty of room for adding extra circuits.

Assembly would have only taken about 45 minutes if not for several unforeseen difficulties.

Allowances were made in the enclosure for the I/O port (for printer and RAM pack) and the side connectors of the ZX81. These enclosures were designed for the British ZX81, not the U.S. counterpart. The result: three needed modifications. First, after removing the ZX's PCB, I removed the small metal tab that grounds the inside aluminized plastic case of the ZX to the PCB. It's not necessary to the computer's function and is there to allow the ZX81 to pass FCC regulations. In the enclosure it could interfere with keyboard operation.

Next, the small switch on the PCB used to select the VHF TV channel (also not on the British version) must be moved--it does not clear the bottom of the enclosure chassis. Simply unsolder the switch and resolder it sideways.

Finally, the hole provided for the video modulator output (or TV socket) is about 1 1/2" too close to the front of the enclosure. The easiest solution is to drill a new hole in the enclosure, wide enough to allow the modulator plug and socket to clear the enclosure case. I had to drill through the bottom chassis of the enclosure as well. Don't allow metals outside the plug or socket to make contact with the enclosure.

Despite the extra work involved, the ease and joy of using a full sized keyboard, without the worry of typos, outweighs the need to make minor modifications.

Jim Moyer, Ontario, Canada

BOOLEAN DEMONSTRATION--8K/1K

If the ZX81 is your first exposure to computers and programming, you may have trouble understanding Boolean logic. Initially, I was completely confused by the explanations and exercises for the AND, OR and NOT functions as provided in ZX81 Basic Programming. A friend showed me a program similar to Listing 1, and I began to comprehend the mysteries of Boolean algebra after running a few values for X and Y through it.

I dressed the program up a little and added a replay function. If you only have 1K RAM, delete odd-numbered lines. One note of caution! Add a new line 175 STOP. This prevents error 7 (no corresponding GOSUB for a RETURN statement) in the shortened version.

To run the program hit RUN, ENTER. You are prompted to key in values for X and Y. The results of the AND, OR and NOT functions are displayed for you. The program prompts you with "AGAIN? (Y/N)". To rerun, hit Y ENTER; N ENTER lets you exit the program.

Any numeric values can be used for X or Y, but zero and one can illustrate most of the salient points. Try the following values for X and Y:

X	Y	X	Y
0	0	0	1
1	0	1	1
-1	0	-1	1
0	-1	-1	-1

Were you surprised at the results? Go back and reread Chapter 10 of the ZX81 manual. The AND, OR and NOT functions can be very useful and powerful programming tools!

John C. Connell, Middletown, RI

```

5 REM "BOOLEAN DEMO"
10 PRINT "ENTER A VALUE FOR X."
20 INPUT X
30 PRINT X
35 PRINT

```

```

40 PRINT "ENTER A VALUE FOR Y."
50 INPUT Y
60 PRINT Y
70 IF X AND Y THEN GOSUB 300
80 IF X OR Y THEN GOSUB 400
90 IF NOT X THEN GOSUB 500
100 IF NOT Y THEN GOSUB 600
110 PRINT
120 PRINT "THE VALUE OF X AND Y"
130 PRINT (X AND Y)
140 PRINT
150 PRINT "THE VALUE OF X OR Y"
160 PRINT (X OR Y)
175 PRINT
245 PRINT
255 PRINT "AGAIN? (Y/N)"
265 INPUT A$
275 IF A$="N" THEN GOTO 1005
285 IF A$="Y" THEN GOTO 705
295 GOTO 70
300 PRINT
310 PRINT "X AND Y WAS TRUE."
320 RETURN
400 PRINT
410 PRINT "X OR Y WAS TRUE."
420 RETURN
500 PRINT
510 PRINT "NOT X WAS TRUE."
520 RETURN
600 PRINT
610 PRINT "NOT Y WAS TRUE."
620 RETURN
705 CLS
715 GOTO 10
1005 CLS
1015 PRINT "THE END"
SYNTACTIC SUM: 35677, 8K/1K

```

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HARDWARE REVIEW

Product: MD-1 Direct-Connect Modem and RS-232 Port
From: Byte-Back Co., Rt. 3,
Box 147, Brodie Rd.,
Leesville, SC 29070
(803) 532-5812
Price: \$99.95 Kit,
\$119.95 Assembled

Some people just aren't happy with the limited world of the 8K ROM ZX81. Perhaps they shouldn't be. Ads tell you that information awaits you at your fingertips. The tool you need to access this information is a modem.

Modem stands for modulator-demodulator, because it converts electronic signals into tones that can travel over phone lines. Typically, modems either connect directly to the phone line (called direct-connect), or connect to a telephone handset through a speaker near the mouthpiece and a microphone near the earpiece (called acoustically coupled).

Input to a modem consists of a serial bit stream (the number of bits per second sent to the modem is called the baud rate). Modems don't care what bits you send them, but they do care what voltages you use to represent 1 and 0. Most modems use the RS-232C standard. But even RS-232C doesn't specify the code used to represent different characters.

Most computers (ZX/TS excluded) use the American Standard Code for Information Interchange (referred to as ASCII) internally, and therefore communicate with modems and terminals using ASCII. Since ZX/TS machines do not use ASCII, software or hardware must translate or you will only be able to communicate with a limited subset of computers.

One final definition: modems use different frequencies to transmit than they do to receive. Obviously, one modem must transmit on

one set of frequencies while the modem at the other end receives at those frequencies. The frequencies used by the modem at the calling end are the originate frequencies; the others are called the answer frequencies. Modems that can use either set are called originate and answer modems. Many modems used by personal computers originate only.

Byte-Back's MD-1 incorporates a board to generate RS-232 signals, a direct-connect, originate and answer modem board to generate standard communication tones, and cassette software to translate ZX/TS code into ASCII and vice-versa. You needn't worry about not being able to call up your favorite computer system with a MD-1--you can communicate with virtually any kind of computer using the MD-1 with your ZX/TS computer.

We did not build the kit, but the instructions seem complete and clear. Byte-Back also provides technical assistance by phone.

Without modifications, the software provided with the MD-1 runs 300-baud ASCII through the modem, sending uppercase and control characters only, and receiving uppercase and lowercase (lowercase characters are displayed in reverse field). My first attempt at using the modem failed because the computer I called insisted on lowercase input. For speed, the software had to be written in machine code (listing available for \$10), and requires modification to act as more than a "dumb" terminal. Byte-Back plans to offer software allowing downloading programs from CompuServe (a database system) and storing data in memory. On the other hand, the software provided fits nicely in 2K RAM (but not in 1K), dispensing with the need to carry a RAM pack with you to use your TS1000 as a portable terminal. Carrying a recorder to load the tape is a greater drawback.

Byte-Back's hardware exemplifies good design: careful choice

of components to minimize cost; quality, neatly laid-out circuit board; simple packaging; low cost. Their software, on the other hand, works with no frills, and, in fact, with not all the neccessities. Most of the missing features (no lowercase input, for example) can be avoided easily. But if you expect performance like a typical \$1000 terminal, there is no emulation of cursor positioning, clear screen, home, or many of the other amenities that have been in terminals for years.

If you don't mind loading a program to use your modem, and don't need frills (or can add them yourself), Byte-Back's MD-1 will work for you.--EO

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Rolf L. Miller, Ventura, CA

```

10 DIM A$(5)
20 FOR X=1 TO 5
30 INPUT N1
40 PRINT N1
50 INPUT N2
60 PRINT N2
70 LET A$(X)=CHR$(N1*16+N2)
80 NEXT X
90 PRINT
100 PRINT
110 FOR X=1 TO 5
120 LET N1=INT (CODE A$(X)/16)
130 LET N2=CODE A$(X)-(N1*16)
140 PRINT N1,N2
150 NEXT X
SYNTACTIC SUM: 12486, 8K/16K

```

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Publisher: Kirtland H. Olson

Editor: Ann L. Zevnik

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